Do competitive sellers disclose their offers? Consumer sophistication does not matter

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Abstract

The theory of asymmetric information suggests that economic agents tend to use their informational power to exploit other less informed players. Both lawyers and economists have stressed on the implications of asymmetric information characterizing standard form contracts.

Generally speaking, the literature has focused on the possible effects of regulation in order to identify whether the most efficient legal regime is that with sellers being free to choose terms and conditions to include in their contracts or a regulated system imposing some limits to sellers' freedom in order to protect possibly unaware consumers. In this paper, we prove that in the presence of fully rational conusmres who can monitor contract terms at some positive cost, in equilibrium competitive sellers may not disclose their terms even if the disclosing costi s very small and lower than the monitoring cost. Turning to a monopoly, whose analysis is presented to offer a comparison with the results characterizing competitive markets, we find an opposite result that the only seller always discloses in equilibrium.

Such results overturn the traditional belief that competition among firms, contrari to a monopoly, leads the market to an efficient outcome

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1 Introduction

The theory of asymmetric information suggests that economic agents tend to use their informational power to exploit other less informed players. Typical examples are offered by most of the markets for goods and services where adverse selection and/or moral hazard usually characterize sellers' strategies against consumers' interests. Precisely, whereas sellers or producers can know the true value of the good or service on sale simply because it is their job, consumers cannot have access to the same source of information on quality, safety and other non-evident features.

Both lawyers and economists have stressed on the implications of asymmetric information characterizing standard form contracts. Using such expressions lawyers refer to those contracts (1) presented by sellers to consumers in a take-it-or-leave-it form and (2) containing standard terms. The first feature emphasizes the unequal bargaining power between parties: the drafter is usually involved in many transactions of the same type with several different consumers, while the consumer is usually involved in an occasional transaction. It explains why sellers usually include the same terms (for that reason called standard) in every contract, some of which are written in fine print and usually contain terms which turn out onerous to consumers. Precisely, it is not given (rather, very unlikely) that an ordinary consumer, even though a sophisticated economic agent, is immediately able to understand terms written in a technical legal language. For this reason, it is said that understanding the content of fine print implies a cost on the side of consumers.

Economists have focused their attention on this crucial element as shown by the large literature on monitoring or reading costs characterizing standard form contracts. Katz (1990) develops a bargaining model in a form-contract setting involving a seller and a consumer, both drawn from a population of sellers and consumers of various types given by individual's preferences over quality, that is private information on the side of the seller. The contract offered is a pair of price and quality both chosen by the seller: he can decide to make an explicit offer at some positive speaking cost that allows the consumer to observe both clauses without cost; or to propose a contract that allows the consumer to observe just the price for free, but requires it to pay a reading cost in order to observe quality. Katz shows that the consumer never reads in equilibrium, so that the seller will speak only if the speaking cost is below a threshold level; it does not speak and offers the minimum quality level available, otherwise.

Che and Choi (2009) consider a competitive market where sellers may offer a high quality contract (which attracts a proportion of consumers who care of quality) and a low quality contract (which attracts the other consumers). They consider to different legal regimes (named "duty to speak" and "duty to read" depending on whether they must provide clear information to consumers about the quality offered or it must be consumers who have to be careful in reading the contract) showing that none of them predominates, but the outcome approaches the first best in both cases as reading costs approach zero.

Following a different perspective, D'Agostino and Seidmann (2009) compare two different market structure, a monopoly and a perfect competitive market, where the seller(s) can offer either favorable or unfavorable terms which consumers can read at some cost. They show that, contrary to the major legal doctrine[1], onerous terms characterize both markets and regulation aiming to protect consumers in fact harms them if implemented against a monopolist, whereas it turns out effective if implemented in competitive markets.

Generally speaking, the attention of these papers focuses on the possible effects of regulation in order to identify whether the most efficient legal regime is that with sellers being free to choose terms and conditions to include in their contracts or a regulated system imposing some limits to sellers' freedom in order to protect possibly unaware consumers.

[1] Authors reject the Kessler's (1943) argument that regulation in favour of buyers should focus on non-competitive market because only sellers who can exploit some market power, and above all monopolists, could include onerous terms, whereas competition should push sellers to offer efficient terms in equilibrium.

In this paper, which may refer to the special case of contract of adhesion but can also apply to other situations such as the large literature on principal-agent models, does not care of possible regulations in favor of one of the two parties. Rather, we wish to understand whether markets, especially if competitive, may find in themselves the right incentives leading to an efficient outcome in equilibrium. Precisely, we wish to show whether competition among sellers may push them to voluntarily disclose their offers and make consumers fully informed about the transaction terms.

On this point, there is a large literature focusing on the effects of asymmetric information when the less informed party is not fully rational or sophisticated. Schwartz and Wilde (1983) discuss the general problem of price searching and show that in the presence of enough consumers who compare sellers' offers before buying from one of them, competition will lead to an efficient outcome by pushing sellers to offer good terms at the lowest possible price. On a similar line, Shapiro (1995) argues that in the presence of "myopic" (meaning non-fully sophisticated) consumers, competitive firms would have an interest to educate them by disclosing their contracts, offering efficient terms. Also Armstrong (2008) agrees in the possible incentive for sellers to disclose all their prices as they could increase their profits more by increasing prices during the bargaining process rather than by a "rip-off".

On a different point of view[2], Ellison and Ellison (2009) discuss in general terms the problem of consumers' bounded rationality that firms can exploit. Precisely, the authors examine internet transactions where price search engines and obfuscation interact together to make a price search more difficult and sometimes not convenient. Therefore, in contrast with the traditional economics of information disclosure which predicts that disclosure takes place since high-quality firms have an interest to differentiate themselves from others by making consumers fully informed of their offers, the authors emphasize that firms in real environments are not prone to disclose their offers, as well as those clauses regarding add-on goods, to be intended as those prices regarding additional or complementary goods not observed by consumers when choosing to buy the base good (Lal and Matuses, 1994).

Gabaix and Laibson (2006) argue that, in the presence of a fraction of myopic consumers, firms may have no interest to educate them about add-on prices. The reason found by the two authors is that firms are not able to attract consumers by advertising them, since an educated consumer continues on buying from those sellers who shroud add-on prices having now enough knowledge to exploit the contract by substituting away from future use add-ons at a certain effort level.

Gabaix and Laibson assume, as well as the previous literature, that consumers cannot have access to the source of information required to evaluate a seller's offer, proving that in such situations competition among sellers does not avoid opportunistic behaviors, not only supported by asymmetric information but rather by asymmetric information and lack of rationality on the side of

[2] Against the "informed minority hypothesis" on a legal point of view *cf.* Slawson (1975) and Rakoff (1983).

consumers.

This paper is related to this literature: we will model a general market where one or more sellers offer a first-view identical consumption good that may vary only in quality which is not freely observable. We prove that competitive sellers may not disclose in equilibrium even if all consumers are fully rational and may monitor contract terms *ex ante* at some positive cost. Precisely, we show that even if sellers may bear the cost of disclosing quality and that such a cost is lower than the cost for consumers to monitor, sellers may decide not to disclose their offers and include one-sided inefficient terms in some equilibria if the market is competitive, meaning that competition is not able to lead to an efficient outcome. Such a result rejects the legal doctrine based on "market structure" that the risk of one-sided inefficient terms characterize only markets where sellers may exploit some market power, and above all in monopolies (Kessler, 1943).

A non-disclosing equilibrium may be seen as a cartel which sellers fulfil as long as it is convenient to do so. For this reason, we present two variants of the competitive game: the first one is repeated, in the sense that consumers are allowed to match with other sellers in future periods of time, whereas the second is one-shot. In this way we are able to prove the existence of a class of equilibria in which sellers do not disclose independently from sellers' collusion.

Turning to a monopoly, whose analysis is presented to offer a comparison with the results characterizing competitive markets, we find an opposite result that the only seller always discloses in equilibrium.

Although the aim of the paper does not rely on the choice between different legal regimes, the results we obtain raise questions about the implementation of the so-called "duty to speak" regime, as an alternative to the traditional "duty to read" rule based on parties' freedom of contract. Precisely, we show that imposing a duty to speak may turn out useful to the social welfare if sellers are competitive since they may not disclose in a free market; a result that is common to D'Agostino and Seidmann (2009) even though for different reasons. By contrast, imposing a "duty to speak" would turn out redundant in a monopoly where the only seller has always an interest to disclose even if free; rather, other kinds of regulation, especially on price, could be implemented with better outcomes.

The paper is also related to the large literature on searching costs. Diamond (1971) shows that the competitive outcome in equilibrium changes significantly when prices cannot be freely observed, but consumers search sequentially for price information and must pay a search cost in order to observe a given seller's price such that the existence of even small search costs will lead to equilibrium prices in a competitive market from the Bertrand solution to monopoly levels. Our results are partially similar to that characterizing the Diamond paradox even if the key role is not played by the search cost but rather by the monitoring cost. In particular, we will show that monitoring costs may keep price above the Bertrand level but below the monopoly level in a competitive market where sellers do not disclose in equilibrium. In this sense, they influence the final equilibrium price less strongly than search costs in Diamond, and make our results less paradoxical. It follows from the fact that, contrary to Diamond, we allow consumers to observe price for free in every contract, so that sellers cannot increase their prices to the monopoly level. However, when an obscure offer is proposed to consumers, some features are not freely observable and may not be monitored: it allows sellers to keep prices above zero.

The paper is organized as follows. Section 2 presents the model assumptions and specifies the solution concept we use to find the equilibria which are presented and discussed in section 3 for a competitive market (allowing or not allowing for resampling), and in section 4 for a monopoly. Section 5 discusses the implications of disclosure in a comparison with the previous literature and concludes.

2 Model

The game is played by $N \geq 1$ sellers and a unit mass of consumers. Sellers produce a good that is indivisible in consumption and looks like identical to consumers, but may vary in quality according to $q \in \{h, l\}$, with $h > l$. Low quality can be assimilated to bad terms and product components, such as expensive add-ons. Producing high quality costs $c > 0$ to firms, whereas producing low quality costs $c' < c$. For the sake of simplicity we will assume $c' = 0$.All consumers value $L > 0$ a low quality good and $H > L$ a high quality good, but in order to observe quality, if not disclosed by the seller, they must pay a monitoring cost $\mu > 0$. We assume that monitoring is reliable with no risk of fault and may consists of the cost of paying an expert to read and explain fine print, if the contract is standard, or to test the good otherwise. Furthermore, we assume that such a cost is fixed and independent from sellers' strategies. Thus, consumers simultaneously decide whether to accept the offer without monitoring, reject without monitoring, or monitor and then decide whether to accept or reject.

The game consists of N repeated rounds. The first round is structured in two stages:

$1°$ *stage*$-$ Sellers simultaneously decide quality and price and whether to make quality transparent or not;

$2°$ *stage*$-$ Each consumer matches with a seller at some small cost. If quality is made transparent, each consumer observes both the price and the quality for free, matches with a seller and decides whether to accept or reject the offer. If quality is not transparent, each consumer only observes price for free, matches with a seller and simultaneously decide whether to pay the monitoring cost and whether to accept the offer. Those accepting the offer leave the market, whereas the others can match with another seller next round. In contrast to Diamond (1971) and the literature on searching costs, the cost that consumers pay to match a seller is very small and unimportant, but useful in order to exclude equilibria in which consumers who enter the market reject without monitoring with some positive probability.

We assume that sellers cannot change their offers, so that all the other rounds consist of one stage only, corresponding to the second stage of round 1.

If $N = 1$ the seller is monopolist, so consumers cannot search for another offer nor wait for the following round because the monopolist cannot change the offer by assumption. Thus, the monopoly game is one shot by definition.

At the same time, consumers cannot observe other consumers' decisions in the previous rounds, and cannot cooperate. We call $\alpha \in [0, 1]$ the consumers' discount factor of waiting for next round. If $\alpha \simeq 0$ then consumers' expected utility from waiting approaches 0; if $\alpha \simeq 1$ consumers' expected utility from waiting approaches the utility level of buying soon.

A consumer who rejects without monitoring earns $-\varepsilon$; a consumer who accepts an offer with price p without monitoring earns $Q-p-\varepsilon$: where $Q \in \{H, L\}$. A monitoring consumer earns μ less in each eventuality. We assume the entry cost ε is very small and unimportant. In case of rejection and resampling in future rounds, consumers have to pay the entry cost again to enter another shop and their payoff is discounted by the parameter $\alpha \in [0, 1]$.

Sellers know consumers' revenues from goods of different quality, and set price p and quality q. They also choose whether to make quality fully transparent or not. Disclosing quality costs $\delta > 0$. If quality is not disclosed, trivially $\delta = 0$, and we write γ for the probability that quality offered is high. Sellers make their offers simultaneously; so a seller's strategy is a set $\{p, q, \delta\}$.

A seller's payoff from trade with a given consumer is the difference between his revenue and his costs: where revenue is price (p) and costs are incurred by producing high quality and/or by disclosing the offer.

We use an Efficiency Condition throughout the paper: $H - c - \max\{\mu, \delta\} - \varepsilon > L > 0$. The left-hand inequality implies that it is socially efficient for players to trade a high quality good. The right-hand side inequality simply implies that trade is mutually profitable even if quality offered is low, and excludes no trade equilibria.

We will solve the game by searching for symmetric subgame-perfect equilibria ('equilibria') in a competitive market and in a monopoly. According to D'Agostino and Seidmann (2009), equilibria will be symmetric in the sense that all sellers will make the same offer to all consumers: a condition that must hold if the seller is monopolist. At the same time, symmetry also implies that consumers match with a given seller with the same probability and attaches the same probability that a given seller offers high quality given the price charged. Together with the assumption of sellers being not able to change their offers over rounds, that assumption will simplify the analysis, especially for the competitive market which we focus on. We investigate whether offers are made fully transparent or obscure in equilibrium in the two markets and show that competition may not lead to disclosure in the interests of consumers even if the disclosing cost is very small. By contrast, we will prove that a monopolist would always disclose in equilibrium if disclosure is not too expensive.

Even though such a conclusion is counter-intuitive, the intuition behind it is quite straightforward. If all sellers make obscure offers then sophisticated consumers will be sceptical about the content they do not monitor because they know that sellers may have included bad terms. It allows for equilibria in mixed strategies in which they monitor with some positive probability and sellers offer high quality with some positive probability charging a price greater than cost that allows for positive profits. We find that deviating to disclosure turns out unprofitable in some equilibria, even if the game is not repeated. If offers are made transparent consumers can buy without monitoring since sellers have to offer efficient terms. By contrast, a monopolist has always an interest to disclose and offer good terms as he is allowed to rise price up to consumers reservation level and increase his profits. In terms of welfare, our results encompass D'Agostino and Seidmann's conclusion that disclosure turns out in the consumers' best interest (in terms of payoff) when sellers are competitive because they have to offer efficient terms at the lowest possible price to attract consumers. In contrast, it harms consumers when the seller is monopolist as it offers efficient terms, but can also increase the price up to consumers' reservation level.

Obviously, in the extreme case of $\mu = 0$, consumers always monitor in equilibrium and reject any $p > L$ if quality turns out low. Thus, a monopolist offers $\{H - \varepsilon, h, 0\}$ and gets $H - c$, whereas competitive sellers offer $\{c, h, 0\}$ and get 0. consumers get 0 if they face a monopolist, and $H - c - \varepsilon$ if they face a competitive seller and such equilibria are both efficient.

We will now assume that $\mu > 0$ and omit the entry cost ε.

3 Competition

In this section we assume there is a fixed number $N \geq 2$ of sellers. Contrary to D'Agostino and Seidmann[3] (2009) who assume N adjusts so that sellers make no profits in every equilibrium[4], we allow for sellers getting positive profits in equilibrium. It makes the analysis cover a large spectrum of real markets. The assumption of sellers making positive payoffs, used by Gabaix and Laibson (2006) as well, is useful in order to understand whether real firms, making in fact small but positive profits, have an interest to disclose or not. However, to make the analysis as simple as possible and without affecting the main message, contrary to Gabaix and Laibson (2006) we assume that sellers do not differ from each other in terms of reputation or size, so that they share the market equally.

We first consider the simplest case in which consumers' expected utility of waiting for future rounds tends to 0 ($\alpha \to 0$). It means that consumers need the good soon and cannot wait for possible better offers. If this is the case, then the game becomes one shot because those consumers rejecting in the current round have no interest to match with another seller next round as their utility from purchasing the good would approach 0 and they would lose the entry cost ε. So, they exit the market as well as those who have purchased.

Then, we deal with the opposite case $\alpha \to 1$ and allow for resampling.

[3] The reason why they use such an assumption is easily explained in the light of the analysis they conduct on the effects of public regulation or courts' intervention: assuming that sellers do not make positive profits in equilibrium strenghtens the analysis making their results more robust.

[4] The authors, however, allow for positive payoffs per trade characterising some equilibria.

3.1 One-shot game

Consumers entering the market in round 1 never reject without monitoring because they would lose the entry cost. Likewise, consumers who reject the offer after monitoring in round 1 exit the market as they would get exactly zero from purchasing in future periods of time because $\alpha = 0$.

Proposition 1 *There exists a pure strategy equilibrium for sellers disclosing and offering* $\left\{c + \frac{\delta}{N}, h, \delta\right\}$ *and getting* 0*, and consumers accepting and yielding* $H - c - \frac{\delta}{N}$*. There exists also an equilibrium in which sellers mix between disclosing and non-disclosing and consumers accept only from those who disclose.*

No other equilibrium exists if $\mu > \frac{H-L}{4}$*; otherwise, if* $L \geq c$*, there may exist a class of equilibria in which sellers do not disclose and mix between* $\{p, l, 0\}$ *and* $\{p, h, 0\}$ *with* $p > c$*, and consumers mix between monitoring and accepting without monitoring. Both sellers and consumers get positive payoffs in such a class of equilibria.*

Only equilibria in which sellers disclose may be efficient if δ *tends to* 0*.*

Proof. No equilibrium exists for sellers offering $\{p, h, 0\}$: consumers would accept without monitoring at any $p \leq H$, so each seller could profitably deviate to $\{p, l\}$. No equilibrium can exist for sellers offering $\{p, l, 0\}$ at any $p > 0$, else each seller could profitably undercut.

Suppose that sellers offer $\{0, l, 0\}$, which consumers would accept without monitoring. Consumers earn L from such an offer and would deviate to a seller offering a transparent $\{q, h, \delta\}$ such that $q < H - L$. That seller would get $H - L - c - \delta$ from such a deviation, which Efficiency Condition assures being strictly positive, and therefore profitable.

In turn, the only pure-strategy equilibrium is for sellers offering $\left\{c + \frac{\delta}{N}, h, \delta\right\}$ and getting 0; no seller can deviate to a higher price because he would make no sale. Consumers accept and earn $H - c - \delta$.

Now suppose that sellers mix between $\{p, h, 0\}$ and $\{p, l, 0\}$. No equilibrium can exist for consumers either monitoring or accepting without monitoring because sellers would never offer respectively $\{p, l, 0\}$ or $\{p, h, 0\}$. Then, consumers must mix between monitoring and accepting without monitoring.

Each seller gets $\frac{p-c}{N}$ from $\{p, h, 0\}$ and $\frac{ap}{N}$ from $\{p, l, 0\}$, where a is the probability of consumers accepting the offer without monitoring. So, sellers are indifferent iff $m = \frac{c}{p}$, where $m = 1 - a$ is the probability of consumers monitoring. No seller can profitably deviate to not trading if $p > c$.

Consumers get $\gamma H + (1 - \gamma)L - p$ if they accept without monitoring, and $\gamma(H - p) - \mu$ from monitoring. Thus, they are indifferent iff $p = L + \frac{\mu}{1-\gamma}$ and do not deviate to rejecting without reading iff

$$\gamma \in \left[\frac{1 - \Delta}{2}, \frac{1 + \Delta}{2}\right]$$

where $\Delta = \sqrt{1 - \frac{4\mu}{H-L}}$ is well defined because $\mu \leq \frac{H-L}{4}$.

consumers would deviate to a seller offering $\{z, l\}$ if

$$L - z > \gamma H + (1-\gamma)L - p$$

Substituting for p, it requires

$$z < L(1+\gamma) - \gamma H + \frac{\mu}{1-\gamma}$$

Such a deviation is profitable for sellers iff

$$L(1+\gamma) - \gamma H + \frac{\mu}{1-\gamma} \leq \frac{L + \frac{\mu}{1-\gamma} - c}{N}$$

that is satisfied if

$$\gamma \in \left[\frac{NH - L + c - \Omega}{2N(H-L)}, \frac{NH - L + c + \Omega}{2N(H-L)}\right]$$

where $\Omega = \sqrt{[NH - L(2N-1) - c]^2 - 4\mu N(N-1)(H-L)}$ is well defined iff $\mu \leq \frac{[NH-L(2N-1)-c]^2}{4N(N-1)(H-L)}$

Then, the necessary conditions for this equilibrium to exist become

$$\begin{aligned} \gamma &\in \left[\max\left\{\frac{NH - L + c - \Omega}{2N(H-L)}, \frac{1-\Delta}{2}\right\}, \min\left\{\frac{NH - L + c + \Omega}{2N(H-L)}, \frac{1+\Delta}{2}\right\}\right] \\ \text{and } \mu &\leq \min\left\{\frac{H-L}{4}, \frac{[NH - L(2N-1) - c]^2}{4N(N-1)(H-L)}\right\} \end{aligned}$$

Suppose $\delta \leq \mu$, so that disclosure is indeed efficient.

A disclosing seller must offer high quality and would attract all consumers by deviating to some price z such that

$$\begin{aligned} H - z &> \gamma H + (1-\gamma)L - L - \frac{\mu}{1-\gamma} \\ &\Leftrightarrow z < (1-\gamma)H + \gamma L + \frac{\mu}{1-\gamma} \end{aligned}$$

Such a seller would therefore get strictly less than $(1-\gamma)H + \gamma L + \frac{\mu}{1-\gamma} - c - \delta$ from disclosure, which is profitable if

$$(1-\gamma)H + \gamma L + \frac{\mu}{1-\gamma} - c - \delta > \frac{L + \frac{\mu}{1-\gamma} - c}{N}$$

Since $\delta \leq \mu$, it can be re-written as

$$(1-\gamma)H + \gamma L + \frac{\mu}{1-\gamma} - c - \mu \geq \frac{L + \frac{\mu}{1-\gamma} - c}{N}$$

A sufficient condition for sellers to disclose is therefore

$$\gamma \leq \frac{NH - L - c(N-1)}{N(H-L)} \quad [1]$$

If $L \geq c$, then $\frac{NH-L-c(N-1)}{N(H-L)} < \frac{1-\Delta}{2}$ and condition [1] is never feasible in equilibrium meaning that sellers do not disclose in such a class of equilibria. Such a result trivially holds if $\delta > \mu$.

There can also exist an equilibrium in which sellers mix between $\left\{c + \frac{\delta}{N}, h, \delta\right\}$ and $\{0, l, 0\}$: consumers accept only from those making a transparent offer because Efficiency Condition states that $H - c - \delta > L$. Thus, sellers get 0 from any offer.

On the other hand, there cannot exist an equilibrium in which sellers mix between $\{p, h, \delta\}$, $\{q, l, 0\}$ and $\{q, h, 0\}$. Those making their offer transparent cannot charge more than $c + \delta$, otherwise another seller could profitably undercut. It means that sellers must earn 0 from disclosure, so they could profitably deviate to an obscure offer that yields a positive payoff.

By contrast, no equilibrium can exist for sellers mixing between $\{p, l, 0\}$ and $\{z, h, 0\}$ with $H \geq z \geq L \geq p$: consumers would always accept without monitoring when charged $q \leq H$, so sellers could profitably deviate to $\{q, l\}$ to economize on the production cost. For similar reasons there cannot be equilibria for a monopolist mixing between either $\{p, h, 0\}$ and $\{z, h, 0\}$ or $\{p, l, 0\}$ and $\{z, l, 0\}$.

Every equilibrium in which sellers do not disclose is inefficient because sellers never offer high quality without consumers never paying the monitoring cost: it comes straightforwardly from Efficiency Condition. Conversely, trade is efficient in every equilibrium in which sellers disclose because quality on sale is high, but not the final outcome because firms waste the disclosing cost. However, it is less inefficient than the outcome without disclosure if $\delta < \mu$. ■

Note that sellers spread the disclosing cost over the number of consumers they match with.

We postpone comments after the analysis of the repeated game.

3.2 Repeated game

In this subsection we assume that the discount factor α is positive such that consumers may get a positive expected utility from rejecting this round and matching with another seller next round. For the sake of simplicity, we will limit the analysis to the special case $\alpha = 1$, meaning that consumers are indifferent between buying today or tomorrow at the same price. Obviously the highest total entry cost that a consumer may pay from resampling is $N\varepsilon$ if she matches with all N sellers. However, we have assumed ε being so small that it does not affect equilibrium conditions. Thus, we will omit it again from the analysis.

Since consumers who buy are assumed to leave the market, sellers' reputation plays no role in the game and is not taken into account.

Proposition 2 *If $\alpha = 1$, then:*

1) There exists an equilibrium in which sellers disclose and offer $\left\{c + \frac{\delta}{N}, h, \delta\right\}$ or mix between $\left\{c + \frac{\delta}{N}, h, \delta\right\}$ and $\{0, l, 0\}$ with consumers accepting only from those who disclose: sellers get 0, whereas consumers get $H - c - \delta$.

2) If μ is small enough and $\gamma = \frac{1-\Delta}{2}$, there exists also a class of equilibria in which sellers do not disclose and mix between $\{p, h, 0\}$ and $\{p, l, 0\}$ with $p > c$, and consumers mix between monitoring and accepting without monitoring. Both sellers and consumers yield positive payoffs.

All these equilibria are inefficient. However, trade is less inefficient in those equilibria in which sellers disclose and $\delta < \mu$.

Proof. 1) Since sellers cannot change their offers over time, it turns out that pure-strategy equilibria correspond to those characterizing the one-shot game. Thus, seller always disclose and offer $\left\{c + \frac{\delta}{N}, h, \delta\right\}$ and get 0, whereas consumers accept getting $H - c - \frac{\delta}{N}$. Then, trade takes place in round 1 in this class of equilibria.

For similar reasons there may also exist an equilibrium in which sellers mix between $\left\{c + \frac{\delta}{N}, h, \delta\right\}$ and $\{0, l, 0\}$: trade again takes place only in period 1 and the analysis follows that in the previous proof.

2) Now suppose that sellers do not disclose and mix between $\{p, h, 0\}$ and $\{p, l, 0\}$.

Since $\alpha = 1$, consumers get $\gamma H + (1-\gamma)L - p$ from accepting without monitoring in every round. It excludes the existence of equilibria in which consumers mix in round 1 and accept thereafter[5]. About their payoff from monitoring each round they take into account the number of sellers potentially to match with. Starting from the last period, buyers would be indifferent if $\gamma H + (1-\gamma)L - p = \gamma(H - p) - \mu$. In $N - 1$ round, consumers' payoff of monitoring would be $\gamma(H-p) + (1-\gamma)V - \mu$, where V is the expected value that consumers may get from matching with the only seller left next round. Indifference then requires that

$$\gamma H + (1-\gamma)L - p = \gamma(H-p) + (1-\gamma)V - \mu \quad [2]$$

V must be non-negative, else consumers could profitably deviate to rejecting; and the buyer's return after rejecting both sellers must be 0. Thus, [2] and $V \geq 0$ imply that consumers would weakly prefer to accept than to monitor in the last round, meaning that $V = \gamma H + (1-\gamma)L - p$. A result that turns out useful just below.

It follows that in round $N-2$ the expected payoff of monitoring is $\gamma(H - p) + (1-\gamma)[\gamma(H-p) + (1-\gamma)V - \mu] - \mu = [\gamma(H-p) - \mu][1 + (1-\gamma) + (1-\gamma)^2 V]$; thus, going backward to round 1, the expected payoff of monitoring can be approximated to $\frac{\gamma(H-p)-\mu}{\gamma}$, meaning that consumers are indifferent iff

$$\gamma H + (1-\gamma)L - p = \frac{\gamma(H-p) - \mu}{\gamma} \Leftrightarrow$$

$$\gamma = \left\{\frac{1-\Delta}{2}, \frac{1+\Delta}{2}\right\}$$

[5] Such an equilibrium may exist if $\alpha < 1$.

consumers do not deviate to rejecting iff

$$\gamma H + (1-\gamma)L - p \geq 0$$

that requires

$$\begin{aligned} p &\leq \frac{(1-\Delta)H + (1+\Delta)L}{2} \text{ if } \gamma = \frac{1-\Delta}{2} \text{ and} \\ p &\leq \frac{(1+\Delta)H + (1-\Delta)L}{2} \text{ if } \gamma = \frac{1+\Delta}{2}. \end{aligned}$$

A seller offering high quality sells to $1/N$ consumers who match with in round 1; for next rounds, he sells to those consumers who who have read in previous rounds and found no quality $(pr.(m(1-\gamma) + m^2(1-\gamma)^2 + ... + m^N(1-\gamma)^N)$, getting a total profit that can be approximated to $\frac{(p-c)}{N}\left[\frac{1}{1-m(1-\gamma)}\right]$; conversely, if he offers low quality he will sell to those consumers who do not read ($pr.$ $1-m$) in round 1, to those consumers who have read in previous rounds and found no quality providing that they do not read anymore in every other round $t = \{2, 3, ..., N-1\}$ $(pr.1 - m + m(1-m)(1-\gamma) + m^2(1-m)(1-\gamma)^2 + ... + m^{N-1}(1-m)(1-\gamma)^{N-1})$; and finally to those who he matches with in last round, providing that they weakly prefer to accept without reading $\left(pr.\ m^N(1-\gamma)^N\right)$, getting a total profit than can be approximated to $\frac{p}{N}\left[\frac{(1-m)}{1-m(1-\gamma)}\right]$.

Thus, sellers are indifferent iff $m = \frac{c}{p} < 1$; for sellers never offer high quality in an equilibrium if $p \leq c$.

Consumers would deviate to a seller offering $\{z, l\}$ if

$$L - z > \gamma H + (1-\gamma)L - p$$

and that seller would earn no more than $p - \gamma(H-L)$. Such a deviation is unprofitable to sellers if

$$p - \gamma(H-L) \leq \frac{p-c}{N}\left[\frac{1}{1-m(1-\gamma)}\right] \text{ [2]}$$

Given $1 > m(1-\gamma)$ condition [2] is always satisfied for either N small enough or $p \leq \frac{\gamma N(H-L)-c}{N-1}$. the last condition always holds in equilibrium if $\gamma = \frac{1+\Delta}{2}$ and $\mu \leq \min\left\{\frac{(c+2LN)(H-L(N-1)-c)}{H-L}, \frac{H-L}{4}\right\}$; and if $\gamma = \frac{1-\Delta}{2}$ and $\mu \in \left[\frac{(c+2LN)(H-L(N-1)-c)}{H-L}, \frac{H-L}{4}\right]$.

Suppose that sellers may disclose at some cost $\delta \leq \mu$.

A consumer would deviate to that seller if he offers $\{z, H, \delta\}$ such that

$$H - z > \gamma H + (1-\gamma)L - p$$

and that deviating seller would get strictly less than $(H-L)(1-\gamma) + p - c - \delta$, which turns out unprofitable if

$$(H-L)(1-\gamma) + p - c - \delta < \frac{(p-c)}{N}\left[\frac{1}{1-m(1-\gamma)}\right]$$

Since $1 > 1 - m(1-\gamma)$, a sufficient condition becomes

$$p \leq \frac{c(N-1) + N\delta - N(H-L)(1-\gamma)}{N-1}$$

that always holds in equilibrium if

$$\frac{c(N-1) + N\delta - N(H-L)(1-\gamma))}{N-1} \geq \frac{\gamma H + (1-\gamma)L}{2}$$

Since $\delta \leq \mu$, the sufficient conditions are

$$\begin{aligned} \delta &\leq \frac{(H-c)(N(H-c)-(L-c))}{2N(H-c)+H-L} \quad \text{if } \gamma = \frac{1-\Delta}{2} \\ \mu &\geq \frac{(H-c)(HN-L-c(N-1)}{2N(H-c)-(H+L)} \quad \text{if } \gamma = \frac{1+\Delta}{2} \end{aligned}$$

Since $\mu \leq \frac{H-L}{4} \leq \frac{(H-c)(N(H-c)-(L-c))}{2N(H-c)-(H+L)}$, it turns out that sellers may not disclose in equilibrium if $\gamma = \frac{1-\Delta}{2}$.

About efficiency, what said in the previous proof for the one-shot game applies also to the repeated game. ■

3.3 General comments

Results found in this section suggest that competitive sellers may decide not to make their offer fully transparent even if it would be socially desirable to do so. The existence of such equilibria looks like a case of sellers' collusion, such as a merger. In fact, the analysis of the one-shot game allows to reject such an interpretation given that this class of equilibria is feasible even if the game is not repeated and sellers may should find profitable to deviate from a collusive agreement in order to maximize their profits.

Gabaix and Laibson (2006) find a similar result in a market where a proportion of consumers are not fully rational (myopes) and may not learn from sellers' disclosure (*uninformed myopes*). In this model we have assumed that consumers are all rational and become fully informed of the offer terms if sellers disclose. Nonetheless, in some equilibria we find that sellers may not disclose even if the related cost δ is small enough and lower than the cost for consumers to monitor. It suggests that inefficient outcomes may characterize competitive markets even in the presence of sophisticated, fully rational consumers if some information can be hidden by sellers and possibly monitored at some positive cost.

Our results are closely similar to Schwartz and Wilde (1983) who include a searching cost on the consumers' side in order to compare different offers and assume that just a proportion of consumers (called *shoppers*) are willing to pay it. In this way, they consider a market where every information about the offer, including price, is costly to consumers who are heterogeneous as well as in Gabaix and Laibson. We show that a similar outcome characterizes the game even if price is freely observable but not other terms, and consumers are all rational.

Even if our analysis does not refer to the efficiency and effectiveness of different alternative policies, the model suggests that some regulation which assures information disclosure may turn out helpful to buyers, who gain in terms of payoffs if the market is competitive: This result rejects the "market structure" hypothesis proposed by Kessler (1943)[6]. At the same time, the model rejects the legal doctrine of the "informed minority" hypothesis[7] claiming that in the presence of even a small proportion of fully rational consumers competitive sellers may have an interest to offer good terms; an argument invoked by those who are against regulations that limit parties' freedom of contract and also used by courts to decide about the enforceability of standard terms[8]. Rather our results highlight that competitive sellers may offer bad terms in equilibrium even if consumers are all rational and may not disclose their offers even at a relatively cheap cost. The reason has to be found in the existence of a cost for consumers to monitor a seller's offer, which may discourage them from reading terms even if rational. It makes unprofitable for sellers to disclose their offers in respect to some equilibria where they can charge a price higher than costs and offer good terms with some positive probability.

Bakos et al. (2009) raise doubt on the relevance of the "informed minority" hypothesis on an empirical point of view. Precisely, they analyze the on-line market for software licence and find that only one or two out of every thousand over a population of 45,091 consumers observe terms and conditions and partially read them before purchasing; it implies that it is hard to assert that sellers' decision about the quality of the terms to insert in their offers may be influenced by a so small percentage of sophisticated buyers. Thus, our model looks like consistent to this evidence.

Rather, our results suggest that some limits to the sellers' freedom of drafting contracts should be imposed in a competitive market, especially when there exist conditions for sellers not disclosing in a free market (small enough monitoring cost) and the disclosing cost is low enough to make disclosure desirable in terms of the social welfare. Thus, imposing a "duty to speak" to sellers may be a good and effective policy.

. We will see in next section that most of these results do not apply to a monopoly.

4 Monopoly

In this section we solve the same game assuming $N = 1$. It will help highlight the results obtained in the previous sub-section for competitive markets.

Proposition 3 *In a monopoly,*

[6] *Cf.* D'Agostino and Seidmann (2009).

[7] *Cf.* Beales, Craswell, and Salop (1976), Baird (2006) and Gillette (2005).

[8] *Cf.* *ProCD vs. Zeidenberg* 86 F. 3d 1447 (7 Cir. 1996).

1) The only seller always discloses in equilibrium and offers $\{H, h, \delta\}$*: consumers accept and earn* 0*, whereas the monopolist earns* $H - c - \delta$*. This equilibrium is efficient only if* δ *tends to* 0*.*

2) If $\mu < \min\left\{1 - \frac{\delta^2}{H-L}, \delta\right\}$ *and* $\delta \leq \frac{H-L}{2}$*, there exists also a class of equilibria in which a monopolist mixes between* $\{H, h, \delta\}$*,* $\{H - \delta, h, 0\}$ *and* $\{H - \delta, l, 0\}$ *earning* $H - c - \delta$*; and consumers accept a transparent offer and mix between monitoring and accepting otherwise, earning a non-negative payoff.*

Proof. A disclosing monopolist must offer high quality; for consumers would reject any $p > L$ and a monopolist could profitably deviate to $\{L, l, 0\}$ to economize on the disclosure cost.

A monopolist can get $H - c - \delta$ from offering $\{H, h, \delta\}$ and no more than L by deviating to non-disclosure if consumers infers that the monopolist offers low quality if he does not disclose. Efficiency Condition then implies that such a deviation is not profitable because $\delta < H - L$.

Conversely, no equilibrium can exist for a monopolist proposing obscure offers and mixing between high and low quality at the same price: a monopolist must charge less than $H - \mu$, otherwise no buyer would monitor with some positive probability in equilibrium. A monopolist would then get strictly less than $H - c - \mu$ in such a class of equilibria and could profitably deviate to disclosing if $\delta \leq \mu$.

Suppose $\delta - \mu > 0$.

What said above implies that consumers must mix between monitoring and accepting without monitoring. They get $\gamma H + (1-\gamma)L - p$ from accepting without monitoring and $\gamma(H - p) - \mu$ from monitoring, where γ is the probability of a monopolist offering high quality; thus, consumers are indifferent iff

$$p = L + \frac{\mu}{1-\gamma}$$

and do not reject iff

$$\gamma \in \left[\frac{1-\Delta}{2}, \frac{1+\Delta}{2}\right]$$

where again $\Delta = \sqrt{1 - \frac{4\mu}{H-L}}$ is well defined if $\mu \leq \frac{H-L}{4}$.

A monopolist gets $p - c$ from offering high quality and ap from low quality, where a is the probability of consumers accepting without monitoring. So, he is indifferent iff $m = c/p < 1$ because $p > c$.

A monopolist cannot profitably deviate to $\{L, l, 0\}$ iff $p - c \geq L$, that requires

$$\gamma \geq 1 - \frac{\mu}{c}$$

He cannot deviate to $\{H, h, \delta\}$ if

$$L + \frac{\mu}{1-\gamma} - c \geq H - c - \delta$$

Since $\delta > \mu$, a sufficient condition becomes

$$\gamma \geq 1 - \frac{\mu}{H - L - \mu}$$

which cannot hold because $1 - \frac{\mu}{H-L-\mu} > \frac{1+\Delta}{2}$, proving that a monopolist always discloses in equilibrium for any level of δ that is consistent to the Efficiency Condition.

Trade is efficient because the monopolist offers high quality in every equilibrium; however, the equilibrium outcome tend to be efficient only if $\mu > \delta \simeq 0$.

2) Suppose the monopolist mixes between disclosure and non-disclosure. What said above requires $\delta > \mu$. He must offer high quality if he discloses and has no interest of charging less than H because consumers would accept; thus he would get $H - c - \delta$. On the other hand, he gets no more than L from an obscure transaction if μ is large enough. Then, he would be indifferent iff $H - c - \delta = L$, that is excluded by the Efficiency Condition.

If $\mu \leq \frac{H-L}{4}$, then a non-disclosing monopolist may mix between disclosing and charging H, and non-disclosing and mixing between high and low quality at $p = L + \frac{\mu}{1-\gamma}$. It implies that, to be indifferent, it must be

$$H - c - \delta = p - c \quad [3a]$$

$$\Leftrightarrow p = H - \delta \quad [3b]$$

Condition [$3b$] requires $\delta > \mu$, otherwise consumers would never read in equilibrium.

Condition [$3a$] is feasible in equilibrium iff

$$1 - \frac{\mu}{H - L - \delta} \in \left[\max\left\{\frac{1-\Delta}{2}, 1 - \frac{\mu}{c}\right\}, \frac{1+\Delta}{2}\right]$$

where Efficiency Condition implies $1 - \frac{\mu}{H-L-\delta} \geq 1 - \frac{\mu}{c}$; $1 - \frac{\mu}{H-L-\delta} \in \left[\frac{1-\Delta}{2}, \frac{1+\Delta}{2}\right]$ if $\mu < 1 - \frac{\delta^2}{H-L}$[9] and $\delta \leq \frac{H-L}{2}$.

A monopolist earns $H - c - \delta$ in this class of equilibria, while consumers earn a non-negative payoff equal to $\delta - (H - L)\frac{\mu}{H-L-\delta}$.

Trade is efficient in equilibrium as the seller offers high quality whenever he discloses; however, the outcome is still inefficient because the monopolist pays the disclosing cost. However, as long as $\delta \leq \mu$, inefficiency decreases in respect of any equilibrium without disclosure. The outcome becomes efficient in the extreme case of $\delta \simeq 0$. ■

Results show that contrary to competition, disclosure always takes place in a monopoly, where the only seller gains from making his offer transparent as he can raise the price up to the consumers' reservation level. Precisely, a monopolist always discloses whenever $\delta < \mu$, that is to say whenever disclosure is socially efficient; otherwise, he may mix between disclosure and non-disclosure providing that δ is small enough in some equilibria. Such a result looks like very

[9] Note that $1 - \frac{\delta^2}{H-L} < \frac{H-L}{4}$.

similar to Katz (1990) who proves that a monopolist will speak whenever the cost of speaking is below a threshold level; in our model that level is assured by the Efficiency Condition, so that the monopolist always discloses in the only pure-strategy equilibrium. In Katz, a speaking seller offers the full-information profit-maximisation quality. In this model, he offers efficient terms charging the maximum price and is better off in respect to any equilibrium involving obscure contracts. The existence of a mixed-strategy equilibrium does not correspond to Katz because that model allows for pure-strategy equilibria only as he considers a continuum of sellers' and consumers' types.

If a monopoly seems to assume the most efficient (or less inefficient) outcome whenever $\delta \leq \mu$, it turns out less efficient than in a competitive market in the opposite case. Precisely, competitive sellers do not disclose in some equilibria for $\delta > \mu$; an outcome that is unfeasible in a monopoly where the only seller has always an interest to disclose even for high (and therefore inefficient) values of δ, at least if consistent with the Efficiency Condition. It partially rejects Katz's (1990) conclusion that no limits should be imposed to a speaking seller. It implies that a "duty to speak" regime would be redundant if the seller is monopolist. Rather, other rules should be applied in order to assure the seller offers good terms but without paying high and inefficient disclosing costs. In this sense, regulation on price are probably the only way to assure both trade efficiency and consumers' protection. About the last point, results show that consumers get exactly 0 from a transparent offer, so they never gain from disclosure but may lose as they would have got positive payoffs from an obscure offer in some equilibria. It supports the legal doctrine against Kessler (1943), such as Rakoff (1983) and confirms D'Agostino and Seidmann's (2009) main conclusion in respect to regulation.

5 Final remarks

We have provided a very simple model with $N \geq 1$ sellers making an offer which may turn out fully transparent or partially obscure for consumers to understand. We have shown that even if consumers are rational, competition may not push sellers to offer transparent efficient offers in some equilibria if consumers have to pay a cost in order to monitor such an offer. This outcome does not depend on the magnitude of the disclosing cost. *Vice versa*, a monopolist finds always profitable to disclose even if disclosure is more expensive than consumers' monitoring.

The model may be improved by assuming that consumers have different knowledge levels about terms and conditions, meaning that they bear different monitoring costs; at the same time, it may be of some interest to assume consumers' heterogeneity in their attitude to wait for future periods.

Our results go further the Gabaix and Laibson's conclusion that competitive sellers may not disclose in the presence of a high enough proportion of myopic consumers, showing that the decision of sellers to not disclose does not depend on consumers' lack of sophistication, but is feasible in equilibrium even assuming that they are all rational as long as they cannot have free access to given terms and conditions.

Even if the model does not introduce alternative legal regimes into the analysis, its results may be of some help in order to choose between different legal regimes: precisely, rules forcing sellers to disclose may turn out in favor of consumers is sellers are competitive, and may also be socially efficient if the cost of disclosing is lower than the cost of monitoring; *vice versa*, they may be redundant if the seller is monopolist and able to disclose; more importantly, even if implemented, such a policy would not turn out in favor of consumers' interests. However, an intervention different from a mandatory disclosure regime looks like necessary every time disclosure is not socially efficient: it would prevent the monopolist to spend high disclosing costs. Rather, the model suggests that in a monopoly a regulation on price may be the only way to protect in fact consumers' interests.

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